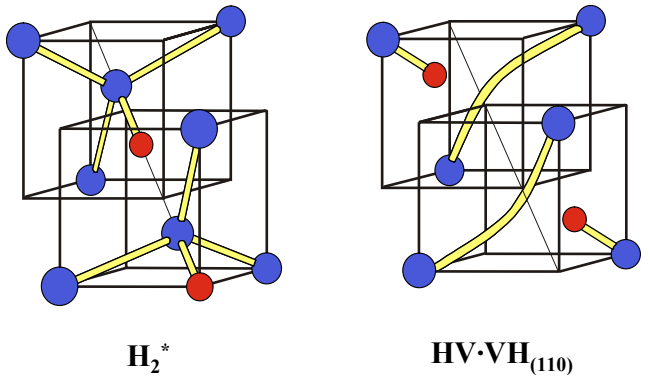
Dynamics of Local Vibrational Modes in Semiconductors I
Gunter Luepke, College of William & Mary, DMR-0076027

Characterization and control of materials on the time scale associated with the fundamental vibration period of solid-state atomic motion reveals new insights into energy pathways.

This direction provides the promise of establishing a new solid-state science involving quantum-level control.

For example, the direct characterization of energy transformation processes in solids in the time domain is now possible due to the availability of tunable ultra-fast optical probes.

Significant progress in reaching this goal has been accomplished in a landmark study exploring the excitation and dynamics of vibrational states associated with hydrogen embedded in semiconductors.



Structure of H_2^* and the divacancy binding of two H atoms, $HV{\cdot}VH_{(110)}$. The blue spheres are Si, the red spheres are H.

Dynamics of Local Vibrational Modes in Semiconductors II
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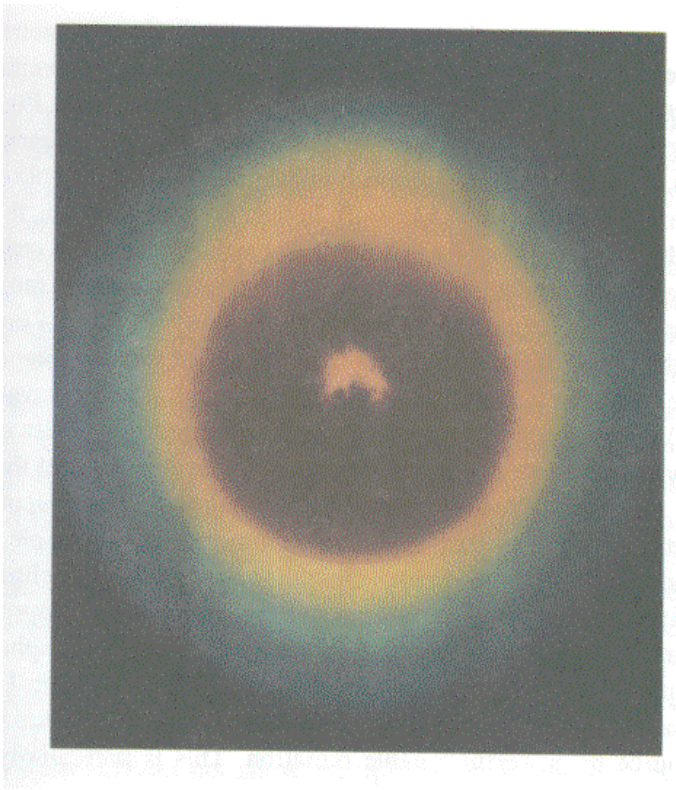
Educational:
1 undergraduate,
1 grad students,

A laser and optics course for graduate and undergraduate students was taught. This course provides a basis for understanding and use of lasers and modern optics in medicine, science, and technology. Emphasis was given to various aspects of coherent intense laser radiation and the numerous applications resulting from these. The course introduces the principles of modern optics from basic geometric and wave optics to the concepts of diffraction, polarization, and coherence to photon theory and quantum behavior of light. Several guest lectures were given, for example on free-electron laser science, pulsed laser-deposition, application of synchrotron radiation, etc.



Spontaneous parametric emission from β-barium borate .